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*A Contribution to the Management of
General Atrophy (Sclerosis?) of the Con-
ducting Apparatus of the Ear.*

BY

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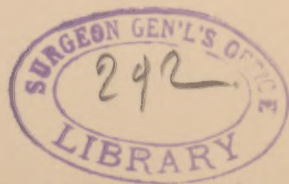
BY S. O. RICHEY, M.D.,
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WHEN discussing the nature of this affection in the *Archives of Otol.*, vol. xv., No. 1, 1886, attention was called to the fact that local stimulation, applied immediately to the diseased tissues, promises the most efficient results yet obtained, but no attempt was made to elaborate the details of management, or to describe the means of producing the desired effect in this peculiar region, difficult of approach, sensitive to and resentful of the presence of instruments and medicaments to which it is unaccustomed, and located so near the centre of the senses that many unexpected manifestations of their displeasure occur, which, though merely functional and temporary, are very disagreeable while they last. The necessity of repeating the manipulations and applications for a long time divests the procedure of any sentimental impressions it might otherwise leave. In the ratio of the rapidity of the increase of the impairment of hearing may we find an indication as to the length of time requisite for its proper treatment; for, the slower its progress, the more firmly will the disease changes have established themselves, and, therefore, the more difficult, and the longer the time necessary to remove them.

Empirically repeated incisions of the membrana tympani may, by the contraction of their cicatrices, restore the membrane to a *shape* more nearly normal, but what will be the ultimate effect of this scar tissue? May it not be worse than the condition it was devised to relieve?

No good reason, based upon pathology, is given for such interference, and I am convinced no thinking man will advise such a course, without a better reason than any yet advanced in its favor. An air-douche to the middle ear, unaccompanied by any other agent, is questionable therapeutics: it is a mechanical shock to a sick organ to be resented sooner or later; generally, at such a time that no connection can be traced.

Depressions of the membrana tympani, alteration in its translucency, thickening of its tissues, and the appearance suggesting adhesions are



probably due to changes in the mucous layer of the membrane and that lining the cavity.

Division of the tensor muscle, the use of Siegle's otoscope, forcible inflation, etc., have been resorted to for the purpose of relieving these features, often with the hearing improved to some degree after each, only to relapse into a worse condition with less prospect of improvement than before.

More frequently a flapping drum-head results, with pain and dizziness when blowing the nose, if there is not stenosis of the Eustachian tubes. The writer has often seen this condition following the too free use of the Politzer or the Valsalvan method of inflation, and generally in the ear not intended to be treated. With gentleness and care this misfortune may be corrected, but forms a long and tedious introduction to the necessary treatment of the original affection, when it happens to an ear already diseased, though it could be avoided by prudence in the beginning.

Too much stress is laid upon the fact that a drum-membrane is depressed, except as an evidence of the affection behind it, and producing it, the improvement of which establishes the proper position and condition of the membrana tympani in a perfectly natural way, by a removal of the cause: just as a pannus may often be cured by treating the conjunctivitis.

The morbid process in the cases under discussion does not, to our knowledge, cause death, and hence our opportunities are limited for completing their history by an autopsy, after close observation during life; and in this way only can the question be definitely settled; but it is not my impression that depression of the membrana tympani is so frequently due to retraction of the tensor muscle, or to adhesions to the inner wall of the cavity, as has been supposed, but, reasoning clinically, to shrinking of the mucous layer of the drum-head from atrophy, which slowly involves the whole membrane. The membrana tympani has, moreover, been seen to change in this feature, and in translucency, with the improvement from dryness and atrophy in the middle ear cavity, and that without special *force* from within. With the change in the mucous membrane toward health is associated a tendency of the membrana tympani to resume its natural and original position, and the less the solution of continuity of tissue has been in the membrana tympani, the better it should perform its function.

How much are we indebted to an atrophied condition of the conducting ear, for that variety of tinnitus, due, probably, to anæmia, which begins before there is any other prominent symptom of disease; which increases slowly, is very intractable, and often is not relieved until long after the hearing is improved? When this tinnitus is dependent upon disease of the naso-pharyngeal space, it is variable; that is, it is heard

sometimes in one ear; again, in the other; and, at another time, in both. It is relieved by restoring in the nasopharynx the natural relations for resonance.

Is persistent tinnitus in a given ear, when cerebral, circulatory, or nasopharyngeal causes can be excluded, not due to a disturbance in the character of the cavity; its moisture, its tension, form, size, etc.? Does not a modification of this alteration, by a topical application of therapeutic agents, offer us the best prospect of success?

The anatomical peculiarities of the tympanic cavity, its impatience of artificial control, and its resentment of the presence of foreign substances, limit, for the purpose of stimulation, the means at our command.

No *fluid* having this therapeutic value can with safety be carried beyond the isthmus of the Eustachian tubes, the danger being that, reaching the cavity, it will settle in the depressions, and by undue action there cause inflammation. We are thus confined to *vapors* for this purpose, because they diffuse themselves throughout the whole cavity without partiality and affect the entire lining membrane, producing no more influence in one locality than in another; they, at least, do this better than any other form of medication.

Chloroform or *ether* vapors have not been very efficient in my hands; for, while they cause considerable hyperæmia, this as readily passes off, unless so much vapor is used as to make the danger of acute inflammation so imminent that I have not felt justified in persisting with it. By very frequent application in moderate quantity, it might serve the desired purpose with diminished risk, but the object to be obtained is an almost *constant fixed action, an approximately continued influence*, and it is not easy to see how, with this agent, it can be accomplished. The mere odor of either chloroform or ether will cause nausea at once in some individuals, and generally does so with all, sooner or later; another reason for abandoning it.

My intention was to try a vapor of *chloroform* and *turpentine*, but the objections to chloroform were so pronounced, and the dread that the vesicular eruption and obstinate ulceration, which turpentine sometimes produces when applied to the skin, might be repeated in the mucous membrane, has so far deterred me from the experiment, which will probably be left to some one bolder.

Ammonia might be serviceable if it could be confined to the middle ear cavity, but its extreme volatility diffuses it through the pharynx and nares in a most uncomfortable way.

In circumstances of extreme difficulty we are apt to be content with what *has* answered the purpose in our hands, and my reliance has been almost entirely upon the vapor of iodine, with good, though not with uniformly satisfactory results.

The method adopted early in my practice is that which I first saw used

by S. J. Jones,¹ of Chicago, which is a modification and combination by him of several other methods. It differs from the Politzer methods in the substitution of the local anæsthesia bulb for the large bag, and *the use of the catheter*, which should be of malleable silver, as this may be readily adjusted in shape to pass through the nostril and reach the Eustachian orifice, anatomical variations being frequent on even the two sides of the same individual. In addition, being made of metal, it may be sterilized by dipping it in alcohol, and burning it out.

By these means we may be satisfied that the vapor reaches the objective middle ear cavity *first*, though the reflux reaches the air passages, from which it is not always desirable to exclude it; and, when it is, the severity of the application may be limited. The *smaller* bulb may be easily and firmly grasped in the hand, is readily compressible, and a measure of the obstruction of the tube, or of the pressure to which the membrana tympani is being subjected, may be ascertained by the resistance of the bulb to the hand. The light and flexible tubing, between the Buttle's inhaler and the hand-bulb, removes the risk of dragging upon the catheter when compressing the bulb; or of bending or breaking the catheter, as some of the books warn us, in describing the use of the Politzer bag with the catheter. *Hard-rubber* catheters are brittle, and require the aid of heat if a change in shape is desired, and for this reason are cumbersome. Besides, they are unclean, because they cannot be as easily and efficiently purified as can the silver instruments, as above suggested. Some silver catheters are rudely and inartistically made, and can be handled with no more facility than those of rubber, but the delicacy and ease of manipulation which can be acquired with the silver instrument, *properly* made, and the complete security against the danger from inoculation when it has been "purified by fire," add greatly to the comfort of the surgeon, and the comfort and safety of the patient.

The mechanical force arising from the quick *shocks* of air propelled by the hand-bulb has seemed to me as objectionable, only in a much less degree, as those inflicted by the large Politzer bag. The pressure in the middle ear cavity is temporarily very great, and a more steady and less forcible pressure must commend itself to our judgment. This I have secured by means of condensed air, with the aid of the air-pump and receiver ordinarily used by laryngologists in spraying the pharynx and the contiguous regions. With the "cut-off" which accompanies this instrument, we may have absolute control of the air-pressure in the middle ear, and if at any time the sharp impulse of air is desired, or deemed advisable, it is easily secured by this means.

¹ Trans. of the International Medical Congress, Philadelphia, 1876. "Modifications of the Methods of Treating Chronic Non-suppurative Inflammation of the Eustachian Tube and Middle Ear."

In the cases of so-called "*dry aural catarrh*," the Eustachian tubes are usually without obstruction, and a pressure of air sufficient to carry the vaporized medicament into the deep recesses of the ear seems sufficient. In my experience, this can be accomplished with a pressure varying from one-fifth to one atmosphere (three to fifteen pounds). The vapor, during the continued pressure, escapes into the pharynx and nares by the side of the catheter, and the return current meeting the advancing current near the orifice of the catheter produces a slight *rustling* sound, which is perceptible by means of the *auscultation tube*. The impingement of the advancing current of air upon the membrana tympani is also to be distinguished, if it reaches the cavity of the middle ear, by a light *blowing* sound.

It is best to suspend the pressure during inspiration, and to continue it during expiration; in this way avoiding, as much as possible, the extension of the vapor to the trachea, bronchi, and lungs, rendering it less disagreeable, and, with the assistance of the column of air expired, securing a more efficient application to the cavity. Besides, the expiration relieves the pharynx and nasal passages of the presence of the reflux of vapor as it escapes from the Eustachian tubes. A white handkerchief held to the nose has often been observed to be stained by the iodine vapor, which could reach it in no other way.

It has become my practice to *moisten* the sponges only when fitting them into the Buttle's inhaler, for by drying they adapt themselves to its shape better; not afterward, for the *crystals* of iodine evaporate with the air passing over them, as well when the sponges are dry as when they are moist. Constant use of the muscles of the forearm in compressing the hand-bulb is not without its risks to the surgeon, as it may induce morbid growths there; another reason for the use of condensed air.

Finding the hand-pump troublesome and inconvenient, my resort has been a hydraulic automatic air-pump,¹ which, being connected with the aqueduct water, gives a pressure of air equal to the pressure of water in the pipes supplying the house. It pumps air into the receiver as it is being exhausted, and maintains an approximately regular pressure. If the pressure of the water in the pipes reaches twenty to thirty-five pounds, it will be sufficient for all ordinary purposes, as the pump will act until equality is established between the pressure of the air and of the water. It is a great saving of labor and attention. The one in my office is known as "*The Reliance*," and was promoted from its original purpose of furnishing air pressure to beer barrels, to its present use. It is a handsome fixture, and can be obtained from Mr. Harvey, of Wash-

¹ Since the writing of the above and after using the apparatus, I find an account of something of the kind used for experimental purposes. Barth, *Archiv. Otol.*, vol. xv. p. 160.

ington, put in position, for about forty dollars. A metal pipe runs from my receiver (which is on the floor) over my table, and is attached to the wall. This contains several stop-cocks, to which may be attached as many different apparatus for spray; between them and the reservoir is a governor which can be set to give the measure of air-pressure desired. By this last item guessing at the amount of pressure is avoided and accuracy may be secured.

The local application of iodized air will be followed by a feeling of warmth and an increase of secretion from the nares and pharynx, before it is perceptible in the ear by the patient, or before the surgeon can assure himself of its effect upon the ear by inspection. The *feeling in the ear* has been aptly described by a young woman, as "just like when you blush." As the vapor is driven into the ear first, the reflux into the pharynx and nares serves as a measure of the impression being made in the cavity of the middle ear, for, in some instances, it is not possible to produce any sensation in the tympanum, or to derive any information from an examination of the membrana tympani in the early stages of the treatment. In advanced cases of the disease no sensation is caused by the vapor for months; but, from the time it is first felt, there is steady increase in sensitiveness, and the severity of influenza following a sitting. This artificial influenza resembles any other, except that it is self-limited and of shorter duration, continuing from two to eight or ten hours; it is more easily produced and lasts longer as the treatment progresses. The use of the vapor has not, under my observation, occasioned anything resembling general iodism.

As it is needful only to maintain a state of hyperæmia as continuous as possible, the intervals between the interviews may be lengthened with the time the effect persists. Increased impairment of hearing and aggravation of any existing tinnitus may occur during the first week of treatment, and this naturally would not be unexpected in a state of tissue-thickening, a result of the hyperæmic condition of the membrane. It is apt to be alarming to the surgeon, unless he has had one experience or more; to the patient it will be disheartening, unless he has been previously advised of its probability, although it has not been observed in all cases. Why it should happen in some instances, only, is not clear, and the percentage of cases in which it does occur has not been ascertained. That it is due to congestion is proved by its occurrence each time the treatment is begun, after an interval of rest, and by the relation it bears to the intensity of the congestion. An improvement in these symptoms, corresponding in extent to their aggravation, takes place upon a discontinuance of the manipulations, which is noticeable in a month, or less, afterward, if the treatment has continued for several months.

If improvement takes place during the use of the vapor, this will be

increased, as indicated, after its suspension. Thus, generally, a gain can be decided only after a rest, which will not interfere with the ultimate result unless it lasts too long.

If the applications be too severe, or if the effect be increased by exposure to draught, or otherwise (and individuals vary greatly in liability to this accident), I have been able, with one exception, to control the resulting inflammation, by pressing against the membrana tympani a tampon of "prepared cotton," the end of which, in contact with the membrane, has been saturated with a solution of argenti nit. 1 : 100 parts. This, done early, often gives as immediate relief from pain as an anæsthetic. It should be left in position for some hours. The astringency reduces the local hyperæmia, and the tampon supports the membrana tympani and prevents its motion during the act of swallowing, or blowing the nose. The patient should be advised of the possibility of the accident, how best to avoid it, and to see the surgeon immediately when it occurs.

Iodized cotton in the external meatus is another means of using iodine. "Prepared" cotton placed in a closed vessel with crystals of iodine absorbs iodine, and parts with it again in the meatus. That this produces the symptoms, hyperæmia of the membrana tympani and external meatus, with some itching of the meatus, is proved in cases where the cavity is exposed by a perforation of the membrana tympani, as pain will result (though not when the drum membrane is entire) and will be relieved by removal of the cotton. The vapor applied to the cavity causes, in time, itching of the meatus in those cases which do well, and this fact induced me to use the iodized cotton in the meatus for its possible effect on middle ear nutrition, and that of the dermis of the meatus and the underlying glands. This application to the meatus is cleaner and more manageable than others, though it may be an advantage to substitute for it, sometimes, the ungt. hydrarg. nit. (pure, or mixed with lanolin in quantity varying to suit the condition), to the dermis. It is not in my power to say how much these aid the case, having never relied upon them alone in any instance, but they do service when the meatus is dry and exfoliating.

Electricity may serve to improve regional nutrition, as it does in trigeminal neuralgia, if a galvanic current be passed from the inferior cervical ganglion to the external meatus and to the Eustachian orifice, the difficulties being the time on the part of the surgeon required for each sitting, and the uncertainty of the result, for it would have to be tried alone to reach a decision as to its value.

To select a proper subject for this purpose, and to do it justice in respect to the individual and the agent both, is not a question of a short time. My reliance upon electricity, in controlling the action of the vasomotors of the region supplied by the branches of the fifth nerve, is

decided. In none but subacute cases has my observation, however, led me to think it acts promptly, and though my limited experience of its influence in cases of atrophy is not satisfactory, yet it is my hope at some future time to make more exact and reliable statements concerning it. Where stenosis of the inferior nasal strait exists, *electrolysis* accomplishes more than any other agent, except, perhaps, thermocautery. If a small silver catheter can be introduced at all, if not, a silver probe will make an excellent conductor, and with one pole at the nape of the neck, and the probe converted into the negative pole, absorption of morbid material may be caused, sufficient to admit the passage of a small catheter at a second interview. The current need not be strong enough to cause much pain. Absorption seems to continue for from a week to a month. Whether absorption of bone-hypertrophy takes place, I cannot yet say. Mayhap some further advantage would arise from the substitution of needles inserted into the diseased tissue, under the influence of cocaine, and electrolysis tried through them. It is a decided gain to avoid the *removal* of any essential part of an organ.

The use of the *steam atomizer*, in preparing the mucous surfaces for the action of the vapor, unnecessarily consumes the time of the surgeon and his client, without compensating advantage, as the stimulation by the vapor increases the quantity and fluidity of the secretion, and accomplishes the same purpose.

A *spray through the catheter* to the pharynx and posterior nares, and even into the Eustachian orifice, of argent. nit., 1; acidi borici, 7; glycerinae, 20; aquae, 500 parts, gives admirable results, when astringency is desirable. Unless forced into the superior meatus of the nares, or beyond the isthmus of the Eustachian tube, it is painless.

In this paper, discussion of the hygienic management is beyond the consideration.

A surgeon who is not full of courage both for himself and his client, who is afraid of labor, or who cannot persist patiently without seeing positive and rapid tissue change, should not undertake this class of cases, for the results cannot be brilliant in the length of time required, nor in their impression upon the ignorant, but are important chiefly to those who suffer. After a spasmodic, which always means an unsuccessful, effort, the difficulty is increased by the additional discouragement to that usually felt by these people. The object is not to claim anything miraculous even in appearance, but to make a decided statement that *all* these cases are *not incurable*, even when far advanced. The condition, the course of treatment necessary and its annoying accompaniments, and the possible expense, should be contrasted with the probable outcome if the disease is neglected, and the individual should be left to decide for himself what he should do. He will often conclude to take the chance of relief, thinking he will persist, but growing weary of the slow im-

provement he may give it up. This, in a measure, is his own affair; but, with this possibility in view, the surgeon does not feel very desirous of the responsibility, though he may have the satisfaction that he has done right in so far as he was permitted. I have never seen an instance in which there was not an amelioration of one or more of the symptoms after a time; a better feeling about the head; an improvement in conscious mental vigor, or in the memory; less tympanic neuralgia, or less tinnitus; increased ability to sleep, which is more refreshing; or an improvement in the power of hearing. In the event that the hearing is not improved, the surgeon, unfortunately, has only the consciousness of duty performed, as the better condition being confined to the patient himself, and not being perceptible to his friends, there is no credit to the surgeon, because the individual "did not get back his hearing." The organ is beyond the vision of all interested, except the medical adviser, and no one appreciates the influence of the *subjective* disturbances, except the physician and the patient, or realizes what relief from them means to the sufferer. The patient's friends, with the best intentions, are, in fact, because of their ignorance, his worst enemies, and a stumbling-block in the path of the surgeon, for they will, by united effort, sometimes convince the patient, contrary to his better knowledge, that there has been no change, as any advantage is so slowly gained that they become accustomed to it. Not infrequently the patient will say, "If I never hear any better, it is worth all the time, expense, and trouble to be relieved of the confusion and weight I have had in my head." One individual said some time ago, that "he would be glad to continue the treatment once a week for the rest of his life for this effect alone, as it had, for some years, been growing more difficult to do brain work, and he thought he must soon give it up." He was one of those who could hear only a loud voice in a moving car, or a din of some kind; a condition which we know to be very intractable. He now hears the ordinary conversational tone three or four feet distant in a quiet room.

This affection is one of such importance to so many people, interfering with their usefulness to society, their personal comfort and happiness, and the convenience of those brought in contact with them, that all knowledge in regard to it repays the endeavor. A faithful consideration of my contribution will prove it rational and in the right direction, so far as it goes, and it is hoped my *confrères* will give the patient attention and trial that the establishment of a reliable means of relief from this disease would deserve. Whatever this means may be, it cannot be speedy in face of the character of the disease. The treatment described unquestionably relieves *some* cases; it has been serviceable to nearly all for whom it has been tried. If some exist who would derive no benefit from it, *why not?* This is an important question, and it may be properly answered, that the trial was not long enough continued.

We must bear in mind that in all these cases the individual, or his friends, have been aware that something was wrong for years, and, knowing its rate of progress after the disease manifests its presence, we may confidently reason that it had been existent a very long time before that, so to impair the organ as to produce troublesome symptoms. A proportionate time and effort must be given to its relief. We patiently and persistently treat a chronic conjunctivitis and its sequelae, and are encouraged to continue by our observation of the structural changes resulting from our efforts, and we must be guided and encouraged in the same way while attempting to improve this condition. We cannot rely entirely on restored function as evidence, for these people are more miserable than the blind, when they become profoundly deaf, without the element of maddening tinnitus which is so often present, and which so wears on the physical strength and the mental equilibrium, ceasing neither day nor night, that it must be an important factor in the causation of insanity and suicide. From a humanitarian view the result striven for is great, and any one who has even temporarily suffered in this way can appreciate what it must mean to be without hope of relief—*incurable*.

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